Engineering Management Capstone Project
EM 697
Compare and Contrast
Risk Management Implementation at
NASA and the U.S. Army

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ABSTRACT

NASA at Marshall Space Flight Center (MSFC) and the U.S. Army at Redstone Arsenal were analyzed to determine whether they were successful in implementing their risk management program. Risk management implementation surveys were distributed to aid in this analysis. The scope is limited to NASA S&MA at MSFC, including applicable support contractors, and the U.S. Army Engineering Directorate, including applicable contractors, located at Redstone Arsenal.

NASA has moderately higher risk management implementation survey scores than the Army. Accordingly, the implementation of the risk management program at NASA is considered good while only two of five of the survey categories indicated that the risk management implementation is good at the Army.

INTRODUCTION

The purpose of this project is to report the survey findings of the Risk Management Implementation at two government organizations. A survey developed by the author, entitled *Risk Management*, was used to solicit this data. The first organization is National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC), and the second is the U.S. Army located at Redstone Arsenal. Both organizations work through matrix support provided to various projects and thus each project would dictate specific needs or requirements from the supporting team. The author will compare and contrast the two organizations' implementation efforts.

ORGANIZATIONS EVALUATED

This section introduces the two organizations to be evaluated. It contains a description of the risk management process utilized by both organizations. Additionally, it defines the risk management categories that will aid in evaluating the effectiveness of the risk management implementation.

NASA. NASA was established in 1958 and has accomplished many great scientific and technological feats in air and space. NASA has also adapted technology for many uses by the private sector. This study focuses on a field installation of the National Aeronautics and Space Administration, the Marshall Space Flight Center, located in Huntsville, AL. MSFC was established in 1960 and named in honor of General George C. Marshall. General Marshall was the Army Chief of Staff during World War II, Secretary of State, and Nobel Prize Winner for his world-renowned "Marshall Plan." The survey focus at MSFC was the Safety and Mission Assurance (S&MA) team. A sample of approximately 100 contractors and civil servants are considered to have been involved in risk management implementation and thus were requested to participate in providing the survey results.

NASA Risk Management. There are three requirements documents for risk management that NASA considers interdependent:

- NPG 8705.XX (draft), *Risk Management Procedures and Guidelines*
- NPG 7120.5A, *NASA Program and Project Management Processes and Requirements*
- NPD 8700.1, *NASA Policy for Safety and Mission Success*

Within *Risk Management Procedures and Guidelines* is the risk management plan and risk lists. Additionally, it contains the Program/project manager acts as the integrator of risk management. Ultimately, it provides additional information for applying risk management as required by NPG 7120.5A.

The definition for risk management can be found in NPG 7120.5A: "an organized, systematic decision-making process that efficiently identifies risks, assesses or analyzes risks, and effectively reduces or eliminates risks to achieving the program goals." Also found in NPG 7120.5A is the NASA risk management process:

- Identify risk issues and concerns
- Evaluate (impact/severity, probability, timeframe), classify, and prioritize risks

- Decide what, if anything, should be done about risks
- Monitor risk metrics and verify/validate mitigation actions
- Decide to re-plan mitigations, close risks, invoke contingency plans, or continue to track risks

NASA's policy can be found in the *NASA Policy for Safety and Mission Success.* The policy states that using qualitative or quantitative risk assessment techniques will maximize the likelihood of mission success. Additional evidence of NASA's commitment and emphasis on risk management is in a NASA presentation (Dr. Michael Greenfield, 1998) titled *Risk as a Resource.* In his presentation, Dr. Greenfield states "effective project management depends on a thorough understanding of the concept of risk, the principles of risk management, and the establishment of a disciplined risk management process." Dr. Greenfield also wrote a paper for NASA that addresses the need for risk to be managed differently such as the "knowledge-based" approach that NASA is moving to.

NASA also conducts risk management training classes for civil servants as well as for their contractors. The risk management class is presented by the NASA Safety Training Center. The class emphasizes that risk management and safety are correlated. The class teaches how a risk is an attribute of a hazard. Additionally, risk is an expression of the combined severity and probability of loss. NASA uses the convention for evaluating the severity of a risk for a hazard by working with the worst credible consequence. When considering probability, operating duration or number of trials/missions/operations is examined. To assess risk, both must be evaluated. A useful tool for assessing risk is a risk assessment matrix. A risk assessment matrix includes the relationship of probability against the severity of the consequence. Below is a simplified matrix.

	Probability of Mishap					
Severity of Consequences	F Impossible	E Improbable	D Remote	C Occasional	B Probable	A Frequent
I Catastrophic						
II Critical						
III Marginal						
IV Negligible						

Some, but not all, of the NASA risk management tools that are in place include:

1. Fault Tree Analysis
2. Failure Mode and Effect Analysis
3. Probabilistic Risk Assessment
4. Reliability Block Diagrams
5. Risk Assessment Matrix

Methods for establishing risk tolerance limits that are utilized by NASA include:

- Formal analysis
- Professional judgment
- Bootstrapping

Risk management roles and responsibilities are also a major factor in effective implementation. For NASA, performing risk management analysis is the responsibility of the line organizations or the staff specialists. However, the acceptance always falls on management.

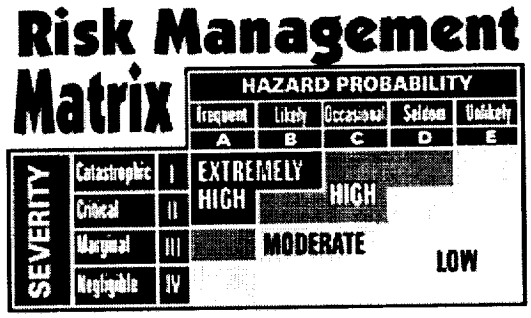
The U.S. Army. In 1941, congress approved funds for the Army to construct a chemical manufacturing and storage facility, Huntsville Arsenal, to supplement the production of the chemical manufacturing plant at Edgewood Arsenal. A facility, initially known as Redstone Ordnance Plant, was built adjacent to the chemical manufacturing installation. The plant was designated Redstone Arsenal in February 1943.

The U.S. Army Aviation and Missile Command (AMCOM) Aviation & Missile Research, Development, and Engineering Center (AMRDEC) Aviation Engineering Directorate located at Redstone Arsenal in Huntsville, Alabama is the focus of this project. The Director of Aviation Engineering is the Airworthiness authority for Army developed aircraft and provides matrix support to their customers. Aviation Engineering direct customers are the Program Executive Officer Aviation Program/Project/Product Managers (PMs) and the U.S. Army Aviation and Missile Command (AMCOM) Defense Systems Acquisition PMs. Their ultimate customers are the Army aircraft crew, passengers, and maintainers that operate the Army aviation systems. The Engineering Directorate is made up of approximately 660 employees. The survey was distributed to about 100 contractors and civil servants that were considered to have applicable knowledge of the risk management program implementation.

The U.S. Army Risk Management. For the Army, risk is a way of measuring the potential that an event will result in a negative consequence. The Army has a risk management information system website that contains many useful tools and techniques utilized by the Army. Additionally lessons learned as well as safety information can be obtained from this site. Similar to the NASA philosophy, an Army Program Manager must consider the probability that an event

will occur and the consequences should that event occur when assessing risk. To ensure that DOD is acquiring optimum systems that meet all requirements, Program Managers must manage risk and assess cost, schedule, and performance. Once a risk is assessed, Program Managers must determine how best to handle it. Controlling risk, avoiding risk, assuming risk, and transferring risk are four strategies used. The four strategies can be use alone or in combination. Controlling the risk means lowering the chance that the event will occur. Avoiding the risk means changing the source that is subjecting the program to risk. Assuming the risk means planning for potential consequences. Transferring the risk means having someone else take accountability for the risk.

Similar to NASA, the Army treats risk management as a process for identifying and controlling hazards to protect the force. Risk management is a proven accident-prevention process. According to BG James E. Simmons, director of Army Safety and commanding general of the U.S. Army Safety Center at Fort Rucker, AL, accident rates across the Army dropped following the adoption of risk management as the principle accident-prevention process. He also states that the Army's most state-of-the-art safety weapon is risk management. Risk Management is the Army's principle risk-reduction process to protect the force. The Chief of Staff states the Army goal is "to make risk management a routine part of planning and executing operational missions". Another technique used by the Army is the five-step risk management process. According to BG Simmons, effectively applying the five-step risk management process will help do the right training safely and will also help execute operational missions safely. The Army's Risk Management Card, which includes the five-step risk management process, follows.



The basic principles that provide a framework for implementing the risk management process are:

- Integrating risk management into mission planning, preparation, and execution.
- Making risk decisions at the appropriate level in the chain of command.
- Accepting no unnecessary risk.

Risk management integration strengthens risk management by embedding it in all the Army does, both on and off duty, as organizations and as individuals. Army risk management integration steps are:

1. Identify risk management integration opportunities.
2. Assess improvement opportunities.
3. Develop integration procedures.
4. Assist implementation of integration procedures.
5. Measure and reassess the degree of integration and its results.

Some, but not all, of the Army risk management tools that are in place include:

1. Safety Assessment Procedures
2. Next Ground Accident Assessment for Individual
3. Leader Training Support Package
4. Soldier Training Support Package

5. Small Unit Risk Management Booklet
6. Risk Management Card
7. Protection (Safety) Readiness Checklist from Center for Army Lessons
8. Risk Management WorkSheet
9. CECOM System Safety Lessons Learned Handbook
10. Operation Risk Management Leader's Guide

In addition to risk management tools, below is a helpful listing of policy and doctrinal references related to Army risk management.

- AR 70-1, Systems Acquisition Policy and Procedures, dtd 1997.
- AR 385-16, System Safety Engineering and Management, dtd 3 May 90.
- FM 100-14, Risk Management, dtd 23 April 1998.
- HQDA Letter 5-97-1, Risk Management Integration Responsibilities, dtd 1 May 97.
- MIL-STD-882C, System Safety Program Requirements, 19 Jan 93.
- Center for Army Lessons Learned (CALL) Newsletter 99-5, "Risk Management for Brigades and Battalions", dtd Apr 99.
- FM 101-5 Staff Organization and Operations, dtd 31 May 1997.

Risk management roles and responsibilities are a little different for the Army than for NASA. Leadership at the appropriate level of authority making informed decisions to control hazards or accept risks is the Army standard for risk management. It is the responsibility and accountability of leaders to assess their operation as a total system and to ensure that planning, risk management decisions, and execution proactively identifies hazards, assesses the associated risks, and identifies control measures necessary to reduce the risks to the level commensurate with their commander's intent.

The level of acceptance decision authority is determined by the degree of risk. The risk issue must be elevated to the next higher command when resources to control a high risk are not available. This process promotes that a conscious and informed decision is made to commit the resources to control the hazards or accept the risk.

EVALUATION.

This section of the report evaluates the results from each organization individually. Each organization is measured against criteria established in the distributed surveys.

The surveys provide data based on five risk management categories. The risk management categories, including a demographics section, are: Risk Management Planning, Risk Identification, Qualitative and Quantitative Risk Analysis, Risk Response Planning, and Risk Monitoring and Control. By answering questions in each of these five categories, ranging from answers of strongly disagreeing to strongly agreeing, the respondents indicated whether or not their organization was successful in implementing risk management. A range of six to eleven questions in each of the five categories were answered and assigned a value based on the employee's level of agreement with five being considered the best score in terms of success. A score of three or below provided by the employee indicates a lack of success in this category of risk management implementation. A one was assigned for each answer of *don't know* or *not applicable*. An average of the questions was then calculated.

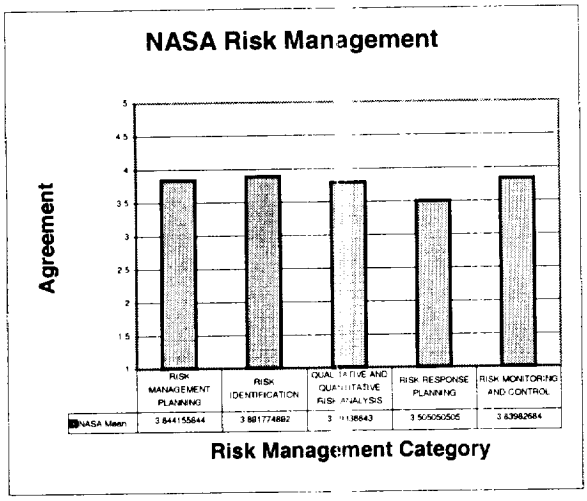
NASA Risk Management Implementation Survey Results and Evaluation. NASA risk management implementation surveys were received from eighteen government and fifteen support contractors. Of the thirty-three surveys, results were received from nine managers, one support staff, and twenty-three technical employees. Of those, 39.39% have worked at or supported NASA over seven years, 27.27% have worked there between one and three years, 18.18% have worked there between three and seven years, and 15.15% have been there for less than one year.

The survey results indicated that NASA was most successful in terms of Risk Management Planning, Risk Identification, and Risk Monitoring and Control with mean scores of 3.8. Qualitative And Quantitative Risk Analysis was next with a mean score of 3.7. Risk Response Planning barely ranked as a slightly positive score with a mean of 3.5.

Although respondents indicated a successful score for Qualitative and Quantitative Risk Analysis, a weakness in the risk analysis process was in testing identified project assumptions against the stability of the assumption and against the impact on the project if the assumption is false.

Three weaknesses were identified in the Risk Response Planning category. One weakness was in changing the project plan to eliminate the risk and protecting the project objectives from the risk's impact to avoid specific known risks. The other two weaknesses are in the risk response plan. The risk response plan does not allow for identification of

residual risks and/or secondary risks and does not allow for identification of contractual agreements.



Army Risk Management Implementation Survey Results and Evaluation. The Army risk management implementation surveys were received from twenty-six government and five support contractors. Of the thirty-one surveys, results were received from five managers and twenty-six technical employees. Of those, 54.84% have worked at or supported NASA over seven years, 22.58% have worked there between one and three years, 16.13% have been there for less than one year, and 6.45% have worked there between three and seven years.

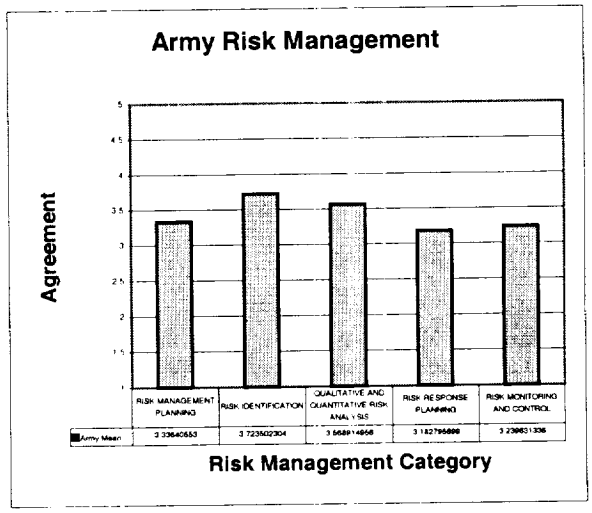
The strongest area for the Army was Risk Identification with a mean score of 3.7 and Qualitative and Quantitative Risk Analysis was next following close with a mean score of 3.6. The other three categories indicate weak areas in risk management implementation for the Army. Risk Management Planning had a mean score of 3.3 while Risk Response Planning and Risk Monitoring and Control each had a mean score of 3.2.

Although respondents indicated an unsuccessful score of 3.3 for Risk Management Planning, responses to individual questions indicated that the Army was strong in that it has a project charter or equivalent and is strong in decision making that influences planning.

Qualitative and Quantitative Risk Analysis received an overall positive score, however, respondents indicated three weaknesses in this area. The respondents indicated that in the risk analysis process, identified project assumptions are not tested against the stability of the assumption and against the impact on the project if the assumption is false. A second weakness is that an overall risk ranking for the project is not provided by the risk analysis in order to assign personnel or other resources to projects with different risk rankings, to make a benefit-cost analysis decision about the project, and/or to support a recommendation for project cancellation. A third weakness is that risk analysis is not used to provide a prioritized list of quantified risks.

Risk Response Planning received positive indications, although having an overall unsuccessful score, in the areas of the Army taking early action to mitigate risks and developing contingency plans in case the risk occurs.

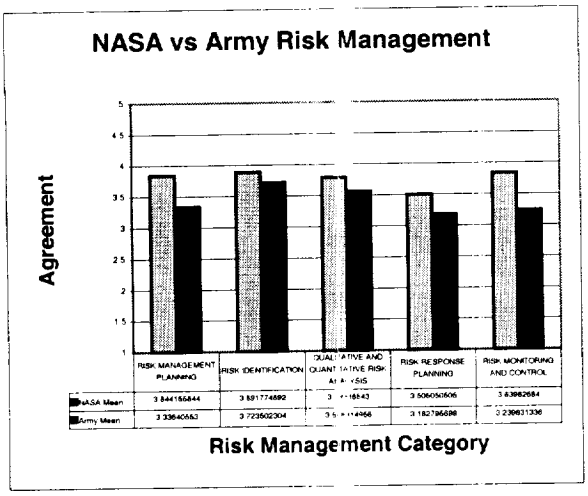
For Risk Monitoring and Control, although an overall unsuccessful score was indicated, a slightly positive score was achieved for using project performance and/or risk reports to monitor and control risks.



COMPARE AND CONTRAST ORGANIZATIONS

This section will attempt to identify the similarities and differences in risk management implementation between the two organizations.

Both are government organizations working under a matrix structure that provides their risk management support. NASA had overall higher mean scores than the Army in each of the five categories. NASA is considered successful in implementing their risk management program with an overall mean score of 3.77 while the Army is not deemed as having a successful program with an overall mean score of 3.41.



Respondents indicated that the strongest risk management category for both organizations is Risk Identification. No obvious weaknesses for either organization were apparent in this category. Risk Management Planning ranked second strongest for NASA and ranked third for the Army. Risk Monitoring and Control ranked third for NASA and fourth for the Army, and Qualitative and Quantitative Risk Analysis ranked fourth for NASA and second for the Army in terms of success. Both organizations ranked the weakest in their Risk Response Planning category.

An area for improvement for both organizations is in the Qualitative and Quantitative Risk Analysis category. Both are weak in testing identified project assumptions against the stability of the assumption and against the impact on the project if the assumption is false. Additional individual weaknesses, as well as noted strengths, are listed in the evaluation sections of this report.

CONCLUSIONS

This section contains the summary of the risk management implementation survey results for NASA and for the Army.

The implementation of the risk management system at NASA is determined to be good. However, the following areas indicate a need for improvement:

- Testing identified project assumptions against the stability of the assumption and against the impact on the project if the assumption is false.
- To avoid specific known risks by changing the project plan to eliminate the risk and/or to protect the project objectives from its impact.
- NASA should develop the risk response plan to allow for identification of residual risks and/or secondary risks.
- NASA should develop the risk response plan to allow for identification of contractual agreements.

The implementation of the risk management system at the Army is determined to be poor. Although survey results in each risk management category indicated an overall weakness for the Army, the following areas indicate a the strongest need for improvement:

- Testing identified project assumptions against the stability of the assumption and against the impact on the project if the assumption is false.
- Using risk analysis to provide an overall risk ranking for the project to assign personnel or other resources to projects with different risk rankings, to make a benefit-cost analysis decision about the project, and/or to support a recommendation for project cancellation.
- Using risk analysis to provide a prioritized list of quantified risks.
- Taking early action to mitigate the risk to reduce the probability and/or impact of a risk to below an acceptable threshold.
- Developing a contingency plan in case the risk occurs once it is decided to accept the risk.

Appendix A: Risk Management Implementation Assessment Survey Summary for NASA

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	TOTAL	AVG	MIN	MAX
	SA = strongly agree; A= agree; D = disagree; SD = strongly disagree, NA = not applicable																																							
1	**DEMOGRAPHIC**																																							
1	Organization Type																																							
	Government																																				18			
	Support Contractor	1	1	1	1	1	1	1	1			1	1																								15			
2	Position in the organization																																							
	management				1						1		1																								9			
	technical employee (I.e. engineer, designer, scientist)	1	1	1		1	1	1	1			1		1	1																						23			
	production employee																																				0			
	support staff (I.e. clerical, human resource)																1																				1			
3	Time in that position																																							

	less than 1 year	1 1 1 1 1	15.1 55152
	1 to 3 years	1 1 1 1 1 1 1 1	27.2 97273
	3 to 7 years	1 1 1 1 1	18.1 1 68182
	over seven years	1 1 1 1 1 1 1 1 1 1 1 1 1	1 39.3 39394
4	Number of employees at your specific site		
	less than 25	1 1 1 1 1 1 1 1 1 1	1 1
	between 25 and 150	1 1 1 1 1 1 1 1 1 1 1 1 1	1 3
	between 150 and 500	1	1
	greater than 500	1 1 1 1 1 1 1	1 8
		S A SN ADDA == = = = 54 3 2 1	
2	**RISK MANAGEMENT PLANNING**		
1	My organization has a project charter or equivalent that includes the business needs and project description at a level appropriate to the needs of the project.	5 4 5 4 5 4 4 4 4 4 5 1 5 5:4 5 1 1 4 4 5 3 5 4 4 4 4 4 4 4 4 5	1 3 4.03 30303 1 5

2	Risk management has not been used in my organization.	3 3 5 3 2 2 2 3 2 2 3 3 3 3:2 2 3 3 3 2 3 2 2 3 3 3 3 3 3 3 1 2	8 2.63 76364 1 5
3	My organization does not have predefined methods for qualitative risk analysis.	2 3 5 3 2 2 2 3 2 3 3 1 2 3:2 3 3 3 3 2 3 3 2 2 2 4 2 2 3 3 4 2	8 2.63 76364 1 5
4	My organization does not have predefined methods for quantitative risk analysis.	2 3 5 3 2 2 2 3 2 3 4 1 2 3:2 3 3 3 3 2 4 3 2 2 2 4 4 2 5 4 3 2	9 2.81 38182 1 5
5	My organization has predefined roles, responsibilities, and authority levels for decision-making that influence planning.	4 4 5 5 4 4 4 4 4 4 4 4 4 4:3 4 4 4 4 4 4 4 5 3 5 4 5 4 4 4 5 5	1 3 4.18 81818 3 5
6	Tolerances for risk are expressed in policy statements or revealed in actions.	4 4 2 4 5 4 5 3 4 2 4 4 4 4.4 5 4 3 4 4 4 3 4 3 4 3 5 4 5 5 1 5	1 2 3.84 78485 1 5
7	A template for my organization's risk management plan exists and is adaptable to each project by the project manager or the risk management team.	5 4 2 3 4 4 4 4 5 3 1 1 4 4.4 5 4 4 3 5 4 4 4 4 5 3 5 4 5 4 1 4	1 2 3.75 47576 1 5
8	The risk management template is improved based on experience from each project.	5 4 1 3 4 4 5 4 5 3 1 1 3 4.4 5 4 4 3 5 3 4 4 3 4 3 4 4 4 5 4 4 2	1 2 3.69 697 1 5

	9	Meetings are conducted that are designed to adapt the risk management plan template to the current project.	4 5 1 3 4 1 5 4 4 4 1 1 3 4 4 4 4 3 3 5 4 3 4 4 4 3 5 4 5 5 4 5 1 2 16667 3.66 1 5
	10	My organization's risk management plan documents how risk identification, assessment, quantification, response planning, monitoring, and control will be structured and performed during the project life cycle.	4 4 1 3 5 4 4 4 5 4 1 1 4 4 4 5 1 1 4 5 4 3 4 5 4 3 5 4 5 4 5 5 1 2 37273 3.72 1 5
		AVERAGE	3.84 4156
3		**RISK IDENTIFICATION**	SA=5 A=4 N=3 D=2 SD=1
	1	Process outputs are reviewed to identify possible risks.	4 4 2 5 4 4 5 4 5 4 3 4 4 4 4 5 4 4 4 5 4 4 4 4 4 4 5 4 5 5 4 5 1 3 92121 4.21 2 5
	2	Risk categories are well defined and reflect common sources of risk for the industry or application area.	4 4 2 5 5 4 4 4 4 4 3 4 4 4 4 5 4 4 3 4 4 3 4 3 4 4 5 3 5 5 4 5 1 3 2 4 2 5
	3	Historical information on prior projects is available for review by the project team.	1 4 2 3 4 4 5 4 4 3 1 4 4 4 2 5 4 4 4 4 4 3 4 3 3 4 2 3 4 4 4 5 1 1 85758 3.57 1 5

4	My organization performs structured documentation review(s) of one or more of the following: project plans and assumptions, prior project files, and other applicable information as an initial step by project teams.	1 4 2 4 4 4 5 4 4 3 1 4 3 5!3 4 3 3 3 5 3 4 4 3 3 4 4 4 5 5 5 5	1 2 3.72 37273	1 5
5	My organization utilizes one or more information gathering techniques in risk identification.	4 4 2 5 5 5 5 4 5 4 1 1 3 4!4 5 3 4 3 5 4 4 5 4 4 4 5 4 4 5 4 5	1 3 4.03 30303	1 5
6	My organization's risk identification process provides adequate indications that a risk has occurred or is about to occur.	4 4 2 4 5 5 4 4 5 3 1 4 4 4.4 4 4 4 3 4 4 4 5 4 4 3 4 4 5 5 4 4	1 3 3.93 09394	1 5
7	A system is in place at my organization to use identified risks as inputs to other processes.	4 4 2 4 5 4 4 4 5 3 1 1 4 4!3 4 4 4 3 4 4 4 5 4 5 3 4 4 3 3 4 5	1 2 3.75 47576	1 5
	AVERAGE		3.89 1775	

4	**QUALITATIVE AND QUANTITATIVE RISK ANALYSIS**	**S A == 5, A == 4, S D == 3, D == 2, N A == 1**	
1	Risk probability and/or risk impact are risk analysis tools used by my organization.	4 4 2 4 5 4 5 4 5 4 1 4 4 5:4 5 4 4 3 5 4 4 5 4 4 4 4 4 5 5 4 5 7 1515 1 5	1 3 4.15
2	Probability / impact risk rating matrix is a risk analysis tool used by my organization.	5 4 2 3 3 4 4 4 5 4 1 4 5 5:4 5 4 4 3 4 4 5 5 4 4 3 4 4 5 5 4 5 4 0606 1 5	1 3 4.06
3	In my organization's risk analysis process, identified project assumptions are tested against the stability of the assumption and against the impact on the project if the assumption is false.	4 4 1 3 4 4 4 4 4 3 1 1 4 3:3 5 4 3 4 4 3 3 5 3 4 3 3 4 3 3 1 4 9 303 1 5	1 0 3.30
4	My organization examines the extent of the understanding of a risk, the data available about the risk, the quality and integrity of the data, and the reliability of the data in order to evaluate the degree to which the data about risks are useful for risk management.	4 4 2 3 5 4 5 4 5 4 1 1 4 4.4 4 4 3 3 4 3 4 5 3 5 3 3 4 4 4 1 4 9 6061 1 5	1 1 3.60

5	Risk analysis is used to provide an overall risk ranking for the project which is used: to assign personnel or other resources to projects with different risk rankings, to make a benefit-cost analysis decision about the project, and/or to support a recommendation for project cancellation.	5 4 2 4 5 4 4 4 5 4 1 1 3 4·3 5 4 4 4 5 3 4 5 4 4 3 3 4 5 5 1 5	1 2 3.78 57879	1 5
6	Risks classified as high or moderate would be prime candidates for more analysis, including quantitative risk analysis, and for risk management action.	5 4 2 4 5 4 5 4 5 4 1 4 4 4·4 5 4 4 4 5 4 4 5 4 5 4 4 5 5 5 1 5	1 3 4.12 61212	1 5
7	My organization utilizes appropriate inputs for quantitative risk analysis	4 4 2 4 5 4 5 4 5 4 1 4 4 4·4 5 1 4 4 4 4 3 5 4 5 4 3 4 5 5 1 5	1 2 3.87 88788	1 5
8	As a part of the risk analysis process, my organization utilizes appropriate tools and techniques.	4 4 2 4 5 4 5 4 5 4 1 1 4 3·4 5 4 4 4 4 4 4 5 4 4 1 3 4 5 4 4 5	1 2 3.81 68182	1 5
9	Risk analysis is used by my organization to provide a prioritized list of quantified risks.	4 4 2 4 5 4 4 4 5 4 1 1 4 4·4 5 4 4 3 4 4 3 5 4 4 3 4 5 5 5 5	1 3 3.93 09394	1 5
10	Risk analysis is used by my organization to provide a probabilistic analysis of the project.	4 4 2 3 5 4 5 4 5 4 1 1 4 3·4 4 4 3 3 4 3 3 1 4 4 3 3 4 4 5 5 5	1 1 3.60 96061	1 5

	11	Risk analysis is used by my organization to provide the probability of achieving the project cost and time objectives.	4 4 2 3 5 4 4 4 5 4 1 1 3 3·3 4 4 1 3 4 3 3 1 4 4 3 3 4 5 5 4 5 4	1 1 3.45 4545 1 5
		AVERAGE		3.79 3388
5		**RISK RESPONSE PLANNING**	**S A = 5, A = 4, N = 3, D = 2, SD = 1** (printed as: S A / S N / A D D A / == = = = / 54 3 2 1)	
	1	To avoid specific known risks, my organization changes the project plan to eliminate the risk or condition and/or to protect the project objectives from its impact.	4 5 2 3 3 4 4 4 5 3 1 1 3 1!4 5 4 1 3 1 3 3 5 3 4 3 4 3 4 4 1 4	1 0 3.24 72424 1 5
	2	To reduce the probability and/or impact of a risk to below an acceptable threshold, my organization takes early action to mitigate the risk.	4 5 2 4 4 4 5 4 5 4 1 4 4 4·4 5 4 4 3 4 4 3 5 3 3 4 4 4 4 5 1 4	1 2 3.81 68182 1 5

	3	If my organization decides to accept a risk, a contingency plan may be developed in case the risk occurs, or the project team may deal with the risk as it occurs.	4 4 2 4 5 4 5 4 5 4 1 4 4 4·4 5 4 4 4 3 4 4 5 4 4 4 4 4 5 5 1 4 0 9394 1 5 1 3 3.93
	4	A risk response plan or equivalent exists and is written to the level of detail at which the actions will be taken.	4 4 2 3 4 4 1 4 5 3 1 1 3 4·4 5 4 3 4 4 4 4 4 4 4 3 4 4 5 5 1 4 7 5455 1 5 1 1 3.54
	5	The risk response plan (or equivalent) allows for identification of residual risks and/or secondary risks.	4 4 2 3 4 4 1 4 5 3 1 1 4 3·3 5 4 1 3 1 4 4 5 4 4 3 4 4 3 4 1 4 8 2727 1 5 1 0 3.27
	6	The risk response plan (or equivalent) allows for identification of contractual agreements.	4 4 2 3 4 4 1 4 4 3 1 1 3 3·4 5 4 1 3 1 4 3 5 4 4 3 4 4 5 5 1 1 6 2121 1 5 1 0 3.21
		AVERAGE	3.50 5051
6		**RISK MONITORING AND CONTROL**	**S A = 5, A = 4, D = 3, S D = 2, N A = 1**
	1	Project performance and/or risk reports are used to monitor and control risks.	4 5 4 4 4 4 5 4 5 4 1 4 5 4·4 4 4 4 3 4 4 3 4 4 4 3 4 4 5 5 4 4 2 4 1 5 1 3

2	My organization implements risk identification, assessment, quantification and response planning for potential risks that surface as a result of measuring project performance.	4 5 2 4 5 4 5 4 5 4 1 1 4 4 4 4 4 3 3 3 4 3 5 4 4 3 4 4 5 5 4 4	1 2 3.81 68182 1 5
3	When required, my organization implements new risk analysis and response plans (or equivalent) as a result of scope changes.	4 4 2 4 5 4 5 4 5 4 1 1 4 4 4 5 4 4 4 3 4 4 5 4 4 3 4 4 5 5 4 5	1 3 3.93 09394 1 5
4	My organization utilizes appropriate tools and techniques for risk monitoring and control.	4 4 3 4 4 4 5 4 5 4 1 4 4 4 4 4 4 4 4 4 4 3 5 4 5 3 4 4 5 5 4 5	1 3 4.03 30303 1 5
5	Plans are updated as appropriate based on risk monitoring and control, workaround plans, corrective action, project change requests, and/or risk response.	4 4 4 4 5 4 5 4 5 3 1 1 3 4 4 4 4 3 4 4 4 4 5 3 3 3 4 4 5 5 1 5	1 2 3.75 47576 1 5
6	My organization implements and maintains a risk database that is used in the risk management process.	4 4 2 3 5 4 5 4 4 4 1 1 4 4 4 5 1 4 3 4 4 3 5 4 4 3 4 4 5 5 1 5	1 2 3.66 16667 1 5
7	My organization updates the risk identification checklists (or equivalent) as appropriate based on risk monitoring and control.	4 4 1 3 5 4 5 4 4 3 1 1 4 4 4 5 4 4 3 4 4 3 5 4 4 3 4 4 3 4 4 5	1 2 3.66 16667 1 5
	AVERAGE		3.83 9827

Appendix B: Risk Management Implementation Assessment Survey Summary for The U.S. Army

RISK MANAGEMENT SURVEY (U.S. ARMY)

		1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1	TOTAL	MMIANX AVG
	SA = strongly agree; A= agree; D = disagree; SD = strongly disagree, NA = not applicable			
1	**DEMOGRAPHIC**			
	1 Organization Type			
	Government	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	26	
	Support Contractor	1 1 1 1 1 1 1 1 1 1	5	
	2 Position in the organization			
	management	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	15	
	technical employee (I.e. engineer, designer, scientist)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	26	
	production employee		0	
	support staff (I.e. clerical, human resource)		0	

			Responses	Total	Percent / Mean	
	3	Time in that position				
		less than 1 year	1 1 1 1 1	5	16.12903	
		1 to 3 years	1 1 1 1 1 1 1	7	22.58065	
		3 to 7 years	1 1	2	6.451613	
		over seven years	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	17	54.83871	
	4	Number of employees at your specific site				
		less than 25	1 1 1	3		
		between 25 and 150	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	16		
		between 150 and 500	1	1		
		greater than 500	1 1 1 1 1 1 1 1 1 1 1	11		
2		**RISK MANAGEMENT PLANNING**				
	1	My organization has a project charter or equivalent that includes the business needs and project description at a level appropriate to the needs of the project.	5 4 4 4 5 4 4 3 4 3 4 1 1 4 3 4 4 5 5 4 4 4 4 1 4 4 4 4 4 5 4	118	3.806452	1 5
	2	Risk management has not been used in my organization.	2 4 3 1 2 4 3 4 4 4 3 3 3 4 4 1 4 3 3 3 4 3 4 3 3 3 5 3 2 2 3	99	3.193548	1 5

	3	My organization does not have predefined methods for qualitative risk analysis.	2 4 3 3 2 4 1 3 1 4 3 3 3 4 4 1 4 4 4 3 3 3 4 3 3 4 5 4 2 2 3 99	3.193548	1 5
	4	My organization does not have predefined methods for quantitative risk analysis.	2 4 3 3 2 5 1 3 1 4 3 2 3 4 4 1 4 4 4 3 3 3 4 3 3 4 5 4 2 2 3 100	3.225806	1 5
	5	My organization has predefined roles, responsibilities, and authority levels for decision-making that influence planning.	5 4 4 5 5 5 4 4 4 4 4 4 5 3 3 4 4 5 4 4 4 4 5 4 4 3 4 3 4 5 4 133	4.290323	3 5
	6	Tolerances for risk are expressed in policy statements or revealed in actions.	5 4 4 1 5 3 1 1 3 3 4 1 1 3 3 4 4 4 3 4 4 4 3 4 4 4 3 4 3 3 3 106	3.419355	1 6
	7	A template for my organization's risk management plan exists and is adaptable to each project by the project manager or the risk management team.	5 3 4 1 5 3 1 1 3 2 4 1 1 3 3 1 3 2 3 1 1 4 2 1 4 3 2 3 3 2 3 85	2.741935	1 7
	8	The risk management template is improved based on experience from each project.	5 3 3 4 5 3 1 1 2 3 4 3 1 2 3 1 3 2 3 1 1 4 2 1 4 3 1 3 3 3 3 89	2.870968	1 8
	9	Meetings are conducted that are designed to adapt the risk management plan template to the current project.	5 3 4 4 5 3 1 2 1 3 4 4 1 3 3 1 3 2 3 1 1 4 2 1 4 3 1 3 3 2 3 92	2.967742	1 9
	10	My organization's risk management plan documents how risk identification, assessment, quantification, response planning, monitoring, and control will be structured and performed during the project life cycle.	5 3 4 4 5 3 1 3 2 3 4 4 1 3 3 1 3 2 3 4 4 4 2 1 4 3 1 3 3 2 3 101	3.258065	1 10
		AVERAGE		3.336406	

3	**RISK IDENTIFICATION**					
1	Process outputs are reviewed to identify possible risks.	5 4 4 4 5 3 4 3 3 3 4 4 4 3 3 1 4 4 3 4 4 4 3 4 4 4 4 4 4 5 4	117	3.774194	1	5
2	Risk categories are well defined and reflect common sources of risk for the industry or application area.	5 3 4 4 5 3 4 3 3 3 4 4 4 3 3 1 4 3 3 4 4 4 3 4 4 3 3 3 4 5 4	113	3.645161	1	5
3	Historical information on prior projects is available for review by the project team.	5 3 3 4 5 4 4 4 4 4 4 3 4 4 3 4 4 3 3 4 4 4 2 4 4 3 2 3 4 5 4	118	3.806452	2	5
4	My organization performs structured documentation review(s) of one or more of the following: project plans and assumptions, prior project files, and other applicable information as an initial step by project teams.	5 4 4 4 5 4 4 4 4 3 3 1 4 4 3 4 4 4 4 4 4 4 3 4 4 5 2 4 4 4 4	122	3.935484	1	5
5	My organization utilizes one or more information gathering techniques in risk identification.	5 3 4 4 5 3 1 4 2 4 4 4 4 3 3 1 4 4 3 4 4 4 4 4 4 4 2 4 4 4 4	116	3.741935	1	5
6	My organization's risk identification process provides adequate indications that a risk has occurred or is about to occur.	5 4 4 4 5 3 1 1 1 3 4 4 4 3 3 1 4 4 3 4 4 4 3 4 4 3 2 3 4 4 4	110	3.548387	1	6

	7	A system is in place at my organization to use identified risks as inputs to other processes.	5 3 3 4 5 3 1 1 1 3 4 4 4 2 3 4 4 4 4 4 4 4 2 4 4 3 2 3 4 5 4	112	3.612903	1 7
		AVERAGE			3.723502	
4		**QUALITATIVE AND QUANTITATIVE RISK ANALYSIS**				
	1	Risk probability and/or risk impact are risk analysis tools used by my organization.	5 3 4 4 5 3 4 4 4 3 4 5 5 3 3 1 3 3 3 4 4 4 4 4 4 5 2 4 4 5 4	118	3.806452	1 5
	2	Probability / impact risk rating matrix is a risk analysis tool used by my organization.	2 3 4 4 2 3 4 4 4 3 4 4 5 3 3 1 3 3 3 4 4 4 3 4 4 4 2 4 4 4 4	109	3.516129	1 5
	3	In my organization's risk analysis process, identified project assumptions are tested against the stability of the assumption and against the impact on the project if the assumption is false.	5 3 3 1 5 3 1 3 2 3 4 4 1 3 3 1 3 3 3 4 4 4 2 1 1 4 2 4 4 4 4	95	3.064516	1 5
	4	My organization examines the extent of the understanding of a risk, the data available about the risk, the quality and integrity of the data, and the reliability of the data in order to evaluate the degree to which the data about risks are useful for risk management.	5 3 3 1 5 3 4 4 4 4 3 4 4 3 3 1 3 3 3 4 4 4 3 1 3 4 2 4 4 5 4	109	3.516129	1 5

5	Risk analysis is used to provide an overall risk ranking for the project which is used: to assign personnel or other resources to projects with different risk rankings, to make a benefit-cost analysis decision about the project, and/or to support a recommendation for project cancellation.	5 3 4 1 5 4 4 2 2 2 4 3 4 3 3 1 3 3 4 4 4 4 3 1 3 3 2 3 4 4 4	104	3.354839	1 5
6	Risks classified as high or moderate would be prime candidates for more analysis, including quantitative risk analysis, and for risk management action.	5 3 4 1 5 1 4 2 2 2 4 5 4 3 3 1 3 3 4 4 4 4 4 4 4 5 5 4 4 4 4	115	3.709677	1 6
7	My organization utilizes appropriate inputs for quantitative risk analysis	5 3 4 1 5 3 1 4 2 4 4 4 4 3 3 1 3 3 4 4 4 4 3 4 3 4 2 4 4 4 4	112	3.612903	1 7
8	As a part of the risk analysis process, my organization utilizes appropriate tools and techniques.	5 3 4 4 5 3 1 3 3 3 4 4 4 3 3 1 3 4 3 4 4 4 3 4 3 4 2 4 4 4 4	115	3.709677	1 8
9	Risk analysis is used by my organization to provide a prioritized list of quantified risks.	1 3 3 4 1 3 4 4 4 3 4 4 4 3 3 1 3 4 3 1 1 4 4 4 4 4 2 4 4 4 4	108	3.483871	1 9
10	Risk analysis is used by my organization to provide a probabilistic analysis of the project.	1 3 3 4 1 3 4 4 4 4 4 4 5 3 3 1 3 3 3 1 4 4 3 4 4 3 2 3 4 5 4	111	3.580645	1 10
11	Risk analysis is used by my organization to provide the probability of achieving the project cost and time objectives.	5 3 3 4 5 3 4 4 4 3 4 3 5 3 3 1 4 3 3 4 4 4 3 4 3 3 2 3 4 5 4	121	3.903226	1 11

	AVERAGE			3.568915
5	**RISK RESPONSE PLANNING**			
1	To avoid specific known risks, my organization changes the project plan to eliminate the risk or condition and/or to protect the project objectives from its impact.	4 3 5 1 4 3 1 3 3 3 4 1 1 3 3 1 4 4 4 4 4 4 3 1 4 5 4 4 4 5 4 2	10	3.290323 1 5
2	To reduce the probability and/or impact of a risk to below an acceptable threshold, my organization takes early action to mitigate the risk.	4 3 4 1 4 3 4 4 4 4 4 4 1 3 3 1 4 4 4 4 4 4 4 4 4 3 4 3 4 4 4 1	11	3.580645 1 4
3	If my organization decides to accept a risk, a contingency plan may be developed in case the risk occurs, or the project team may deal with the risk as it occurs.	4 4 3 1 4 3 4 4 4 3 4 4 4 3 3 1 4 4 4 4 4 4 3 4 4 4 4 4 4 4 4 5	11	3.709677 1 4
4	A risk response plan or equivalent exists and is written to the level of detail at which the actions will be taken.	4 3 3 1 4 3 1 2 2 2 4 1 1 3 3 1 3 3 3 4 4 4 3 1 1 3 2 3 4 5 4 9	8	2.870968 1 5
5	The risk response plan (or equivalent) allows for identification of residual risks and/or secondary risks.	3 3 3 1 3 3 1 2 2 2 4 4 1 3 3 1 3 4 3 4 4 4 3 1 1 3 2 3 3 3 3 8	8	2.83871 1 5

	6 The risk response plan (or equivalent) allows for identification of contractual agreements.	4 3 3 1 4 3 1 2 2 2 4 1 1 3 3 1 3 4 3 4 4 4 3 1 1 3 2 3 3 2 3	87	2.806452	1	6
	AVERAGE			3.182796		
6	**RISK MONITORING AND CONTROL**					
	1 Project performance and/or risk reports are used to monitor and control risks.	4 4 3 1 4 3 4 4 4 3 4 4 4 3 3 1 4 3 3 4 4 4 3 4 4 5 2 4 4 5 4	111	3.580645	1	5
	2 My organization implements risk identification, assessment, quantification and response planning for potential risks that surface as a result of measuring project performance.	5 1 3 1 5 3 4 4 4 3 4 5 4 3 3 1 4 3 3 4 4 4 3 1 3 3 2 3 4 4 4	104	3.354839	1	5
	3 When required, my organization implements new risk analysis and response plans (or equivalent) as a result of scope changes.	5 1 4 1 5 3 4 4 4 3 4 1 4 3 3 1 4 4 4 4 4 4 3 1 3 3 2 3 4 4 4	104	3.354839	1	5
	4 My organization utilizes appropriate tools and techniques for risk monitoring and control.	5 4 3 1 5 3 4 3 4 2 4 4 4 3 3 1 3 4 3 4 4 4 3 4 4 1 2 1 3 2 3	102	3.290323	1	5
	5 Plans are updated as appropriate based on risk monitoring and control, workaround plans, corrective action, project change requests, and/or risk response.	5 4 3 1 5 3 1 2 3 2 4 1 4 3 3 1 4 4 4 4 4 4 4 1 4 3 3 3 3 3 3	101	3.258065	1	5

	6	My organization implements and maintains a risk database that is used in the risk management process.	5 3 2 1 5 2 1 2 3 2 4 1 4 3 3 1 3 3 3 4 4 4 2 1 3 3 2 3 3 2 3 9 1	2.935484	1 6
	7	My organization updates the risk identification checklists (or equivalent) as appropriate based on risk monitoring and control.	5 3 2 1 5 2 1 2 3 2 4 1 1 3 3 1 3 3 4 4 4 4 2 1 3 3 2 3 3 2 3 9 0	2.903226	1 7
		AVERAGE		3.239631	

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RISK MANAGEMENT SURVEY

SA = strongly agree; A= agree; D = disagree; SD = strongly disagree, NA = not applicable

1 DEMOGRAPHIC

1 Organization Type
- Government
- Support Contractor

2 Position in the organization
- management
- technical employee (I.e. engineer, designer, scientist)
- production employee
- support staff (I.e. clerical, human resource)

3 Time in that position
- less than 1 year
- 1 to 3 years
- 3 to 7 years
- over seven years

4 Number of employees at your specific site
- less than 25
- between 25 and 150
- between 150 and 500
- greater than 500

2 RISK MANAGEMENT PLANNING

		SA	A	D	SD	NA
1	My organization has a project charter or equivalent that includes the business needs and project description at a level appropriate to the needs of the project.					
2	Risk management has not been used in my organization.					
3	My organization does not have predefined methods for qualitative risk analysis.					
4	My organization does not have predefined methods for quantitative risk analysis.					
5	My organization has predefined roles, responsibilities, and authority levels for decision-making that influence planning.					
6	Tolerances for risk are expressed in policy statements or revealed in actions.					
7	A template for my organization's risk management plan exists and is adaptable to each project by the project manager or the risk management team.					
8	The risk management template is improved based on experience from each project.					
9	Meetings are conducted that are designed to adapt the risk management plan template to the current project.					
10	My organization's risk management plan documents how risk identification, assessment, quantification, response planning, monitoring, and control will be structured and performed during the project life cycle.					

3 RISK IDENTIFICATION

		SA	A	D	SD	NA
1	Process outputs are reviewed to identify possible risks.					
2	Risk categories are well defined and reflect common sources of risk for the industry or application area.					

3	Historical information on prior projects is available for review by the project team.					
4	My organization performs structured documentation review(s) of one or more of the following: project plans and assumptions, prior project files, and other applicable information as an initial step by project teams.					
5	My organization utilizes one or more information gathering techniques in risk identification.					
6	My organization's risk identification process provides adequate indications that a risk has occurred or is about to occur.					
7	A system is in place at my organization to use identified risks as inputs to other processes.					
4	**QUALITATIVE AND QUANTITATIVE RISK ANALYSIS**	**SA**	**A**	**D**	**SD**	**NA**
1	Risk probability and/or risk impact are risk analysis tools used by my organization.					
2	Probability / impact risk rating matrix is a risk analysis tool used by my organization.					
3	In my organization's risk analysis process, identified project assumptions are tested against the stability of the assumption and against the impact on the project if the assumption is false.					
4	My organization examines the extent of the understanding of a risk, the data available about the risk, the quality and integrity of the data, and the reliability of the data in order to evaluate the degree to which the data about risks are useful for risk management.					
5	Risk analysis is used to provide an overall risk ranking for the project which is used: to assign personnel or other resources to projects with different risk rankings, to make a benefit-cost analysis decision about the project, and/or to support a recommendation for project cancellation.					
6	Risks classified as high or moderate would be prime candidates for more analysis, including quantitative risk analysis, and for risk management action.					
7	My organization utilizes appropriate inputs for quantitative risk analysis					
8	As a part of the risk analysis process, my organization utilizes appropriate tools and techniques.					
9	Risk analysis is used by my organization to provide a prioritized list of quantified risks.					
10	Risk analysis is used by my organization to provide a probabilistic analysis of the project.					
11	Risk analysis is used by my organization to provide the probability of achieving the project cost and time objectives.					
5	**RISK RESPONSE PLANNING**	**SA**	**A**	**D**	**SD**	**NA**
1	To avoid specific known risks, my organization changes the project plan to eliminate the risk or condition and/or to protect the project objectives from its impact.					
2	To reduce the probability and/or impact of a risk to below an acceptable threshold, my organization takes early action to mitigate the risk.					
3	If my organization decides to accept a risk, a contingency plan may be developed in case the risk occurs, or the project team may deal with the risk as it occurs.					
4	A risk response plan or equivalent exists and is written to the level of detail at which the actions will be taken.					
5	The risk response plan (or equivalent) allows for identification of residual risks and/or secondary risks.					

6	The risk response plan (or equivalent) allows for identification of contractual agreements.					
6	**RISK MONITORING AND CONTROL**	**SA**	**A**	**D**	**SD**	**NA**
1	Project performance and/or risk reports are used to monitor and control risks.					
2	My organization implements risk identification, assessment, quantification and response planning for potential risks that surface as a result of measuring project performance.					
3	When required, my organization implements new risk analysis and response plans (or equivalent) as a result of scope changes.					
4	My organization utilizes appropriate tools and techniques for risk monitoring and control.					
5	Plans are updated as appropriate based on risk monitoring and control, workaround plans, corrective action, project change requests, and/or risk response.					
6	My organization implements and maintains a risk database that is used in the risk management process.					
7	My organization updates the risk identification checklists (or equivalent) as appropriate based on risk monitoring and control.					
7	**OPTIONAL QUESTIONS**					
1	I consider the following tools and/or techniques to be greatly effective in my organizations risk management process:					
2	I do not consider the following tools and/or techniques to be greatly effective in my organizations risk management process:					